1(a). Fig. 19.2 shows the emission spectrum for each of three different galaxies.

The same emission spectrum is also shown for an equivalent laboratory source on the Earth.

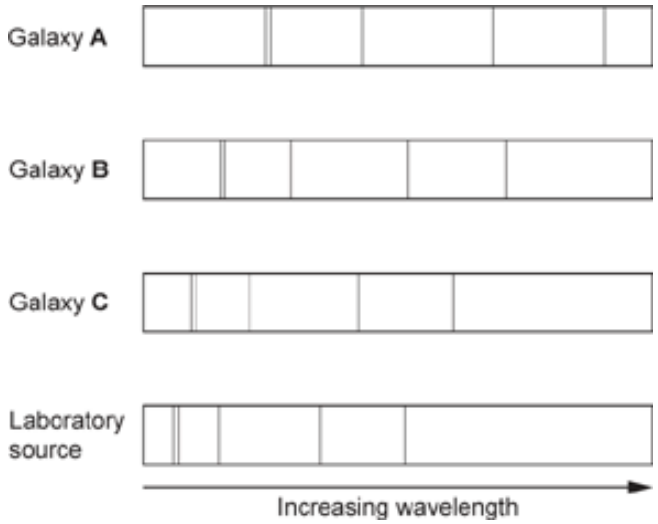

Fig. 19.2

i. The emission spectrum for each galaxy shows red-shift.

Use **Fig. 19.2** to explain what is meant by the term **red-shift**

_____

_____ **[1]**

ii. Which galaxy in **Fig. 19.2** is furthest from the Earth?

Give a reason for your answer.

Galaxy _____

Reason _____

_____ **[2]**

iii. State which theory the spectra from each galaxy in **Fig. 19.2** gives evidence for.

_____ **[1]**

(b). Hydrogen gas is placed in a glass tube in a laboratory.

Fig. 19.1 shows the emission spectrum of hydrogen.

Each line in the emission spectrum has a different colour

Fig. 19.1

i. Complete the sentences to explain the cause of the lines in the emission spectrum.

Use words from the list.

atoms	**electrons**	**light**	**protons**	**sound**

..... move from a higher energy level to a lower energy level and emit .....

[2]

ii. There is a potential difference of 3000 V across the tube.

A charge of 0.08 C flows in the tube.

Calculate the energy transferred.

Use the equation: energy transferred = charge × potential difference

Energy transferred = ... J **[2]**

iii. A special power supply is needed to provide the high potential difference of 3000 V.

Describe **one** risk of using this power supply

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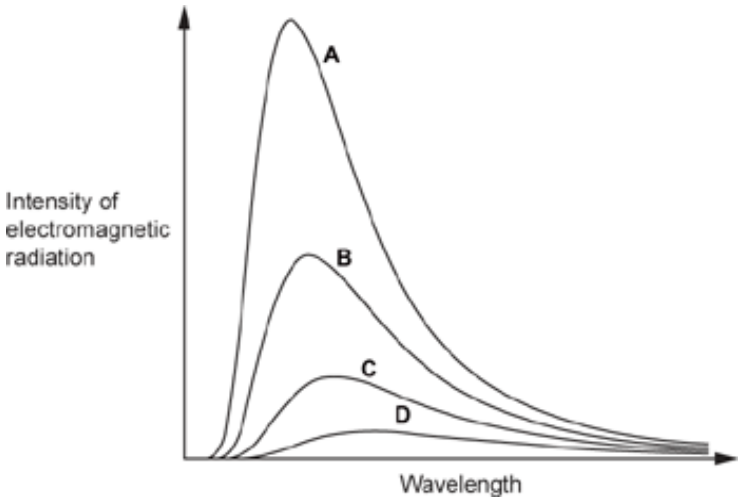
[1]

2. The graph shows the electromagnetic radiation emitted by four objects at different temperatures.

Which object has the **highest** temperature?



Your answer ☐ **[1]**

3. The diagram shows an object in orbit around the Earth.

 not to scale

What is the name of the object?

A A moon
B A natural satellite
C An artificial satellite
D An asteroid

Your answer ☐ **[1]**

4. An astronomer observes a red-shift of light from a distant galaxy.

What does red-shift of light mean?

A The speed of the light has decreased.
B The speed of the light has increased.
C The wavelength of the light has decreased.
D The wavelength of the light has increased.

Your answer ☐ **[1]**

5. Which row describes nuclear **fusion**?

	What happens	Where it occurs
A	heavy nuclei split	in nuclear power stations
B	heavy nuclei split	in the Sun
C	light nuclei combine	in nuclear power stations
D	light nuclei combine	in the Sun

Your answer ☐ **[1]**

6. Which statement about the Solar System is correct?

A Mars is a star.
B Mercury is the planet closest to the Sun.
C Neptune is the planet closest to the Earth.
D Saturn is a moon.

Your answer ☐ **[1]**

END OF QUESTION PAPER